

What is the effect of dung beetles on gastrointestinal nematodes of livestock?

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It has been suggested that, under certain conditions, burial of dung by dung beetles might actually increase the number of gastrointestinal nematodes in livestock because 1) nematode survival might be higher on buried dung compared to dung left on the pasture surface and 2) large numbers of nematodes might then migrate to the surface in damp soils, where they could be picked up by livestock. The conditions that might lead to such an outcome are common in New Zealand, but also possibly occur in southern portions of mainland Australia and Tasmania.

A recent review of the scientific literature (Fowler and Weston, in preparation) has shown that such fears are unwarranted. Most of the studies found that the number of infective-stage nematodes was significantly reduced at the soil surface or on pasture vegetation when dung beetles were present. The reasons for this include the following:

- Shredding of dung leads to water loss by first- and second-stage nematode larvae, owing to their inability to tolerate desiccation. Although shredding of dung can actually increase hatching of nematode eggs in dung because of increased oxygen levels, this effect is more than offset by the higher death rate of first- and second-stage larvae.
- Processing of dung by adult dung beetles prior to burial kills a large proportion of nematode larvae in the dung. This percentage may be as high as 99%.
- Although nematodes are capable of crawling to the soil surface even when buried to a depth of 10 cm or more, they can do so only when soil moisture is quite high because they require a continuous film of water to complete their migration to the surface. This condition is rarely met. In addition, the chances of nematode larvae reaching the soil surface decrease with burial depth, and the beetles that are active when soil moisture might be high enough to support movement of nematode larvae to the soil (winter) bury their dung balls to a depth of 50 cm or more.

The interactions between dung beetles, gastrointestinal nematodes and stock re-infection rates are complex, and require further investigation, especially in cool, temperate areas (areas under-represented in the studies reported in the literature). Simulation models are currently being used to examine these interactions as part of the Dung Beetle Ecosystem Engineers project, but the balance of evidence in the literature suggests that dung beetle activity will either reduce the abundance of infective gastrointestinal nematodes in pastures, or at worst make little difference. This means that dung beetles should be viewed only in light of their documented benefits to pasture health and pest reduction.